PROJECT OVERVIEW
&
STATE OF AVAILABLE SOLUTIONS

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Project Objectives

- To establish standards for the Agency to ensure interoperability, scalability and efficient migration paths

- To perform advanced applications research and development in desktop video technologies such as compression algorithms, effects related to human factors, and connectivity/distribution of video related applications

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Question: Why Desktop Conferencing?
Answer: Improved Communication through

- • Audio/Video Collaboration
    Key verbal and non-verbal communications such as
    body language and facial expressions

- •Data Collaboration
    Shared file capabilities such as ftp, simultaneous file
    manipulation, and whiteboarding

- •Immediate Remote Communications

- •Improved Communications by Reducing Miscommunication

- •Travel Reduction (productivity and cost gains)

Question: Great Benefits. Can I have it now?
Answer: There are Several Issues to Address

- **Interoperability**
  Must have standards to ensure interoperability and wide adoption as in the telephone and fax machine.

- **Transport**
  Applications must support various transports such as ISDN, LANs, and POTS.

- **Bandwidth**
  Mutual effort for data pipes to support quality and population requirements and compression technology to provide low bit-rate solutions.

Question: How Does the DVEC Benefit NASA?
Answer: By Providing a Protocol for DV Deployment.

- **Standards Compliancy**
  Research applicable standards to ensure long term product life-spans and various application interoperability.

- **Testbedding**
  Standards and product testing to ensure manufacture operation and compliancy claims.

- **Advanced Research & Development**
  Study next generation applications for future deployment into existing and next generation networks.

Overview of Requirements

Agency Specific
- **Cross platform i.e. MacIntosh, PC and UNIX**
- **Scaleable i.e. LAN, WAN, MAN, dial-in, circuit switched, et.**
- **Full interoperability between desktop video equipment**

Quality (User Specific)
- **Phone quality audio and television quality video**
- **Local PC quality data exchange**

Performance (User Specific)
- **~15 fps video**
- **echo cancellation**
- **immediate data collaboration update**

Current Contributions

Standards Proposal Document (v2.0)

ITU-T Video Related Standards
- **H.320: targets ISDN communications**
- **H.323: targets Internet Protocol (IP) communications**
- **H.324: targets POTS communications**

Products recommended for Agency use (based on standards compliancy and interoperability)
- **Nine H.320 products**
- **Two H.323 products**
- **Zero H.324 products**

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Current Contributions

Research and Development

Compression Technology
- Comparison between DCT, Wavelet and Fractal based compression algorithms
- To date findings show that the majority of Wavelet based algorithm outperform the popular DCT algorithm
- Ported DCTune(JPEG helper application) to ANSI C to aid speed, distribution and licensing

Networking
- Multicasting via the Mbone i.e. NASA TV and STS Missions
- Research of MPOA and it's benefits in transparent integration of native ATM and IP
- MPEG1 & MPEG2 over ATM

Available Solutions

H.320 (ISDN) Based Solutions

    System Groups
- **Group Systems (ex. PictureTel Venue and Concorde Systems)**
  - **Large to medium conferences**
  - **Typical bandwidth of 384Kbps**
  - **Price range: $15K - $35K**

- **Small Group System (ex. PictureTel Swiftsite)**
  - **Portable (light weight and effortless configuration)**
  - **Typical bandwidth of 128Kbps**
  - **Price range: ~$7K**

Available Solutions

H.320 (ISDN) Based Solutions

- **Desktop System (ex. Intel ProShare, Sagem Meet-Me, ect.)**
  Integrates with desktop computer
  Typical bandwidth of 128Kbps
  Price range: $1K - $4K

- **Common Attributes**
  Interoperable with any H.320 based system
  Defaults to lowest connected bandwidth
  Compatible with H.320 MCUs
  Commonly implemented over Switched-56

Available Solutions

Circuit-Switched Solution (ITU-T H.320)

Advantages
- Dedicated bandwidth for duration of connection
- Predictable data delivery i.e. performance
- MCUs are available from a variety of vendors (purchase/lease)
- Products tested and available for all platforms (Mac, PC, Unix)

Disadvantages
- Bandwidth is wasted during periods of little or no data transfer
- Deviates from consolidation philosophy i.e. requires a unique and dedicated circuit
- High costs

Available Solutions

H.323 (IP) Based Solutions

    Desktop Systems (overview of test results)
- **PictureTel LiveLan v3.0**
  - **30fps at QCIF(176 x 144), 15fps at CIF(352x288)**
  - **Scalable bandwidth (64kbps, 174kbps, and 384kbps)**
  - **T.120 data collaboration**
  - **Phone quality audio**

- **Microsoft NetMeeting v2.0**
  - **Standards based freeware**
  - **Inconsistent data rates with no built-in metrics**
  - **Unresolved audio issues (no product support)**
  - **T.120 data collaboration**
 - **Performance greatly depends of main processor**

Available Solutions

Packet-Switched Solution (ITU-T H.323)

Advantages
- Transparent multipoint conferences via IP multicasting
- Efficient utilization of bandwidth
- Supports Agency consolidation philosophy
- Transparent and wide-scale connectivity
- Little or no connection costs
- Potential in RTP and RSVP protocols in support of QoS
- Impressive results of real-time application tests via NREN/NGI

Disadvantages
- Unpredictable data delivery with existing operational IP networks
  (is being addressed in next generation networking)
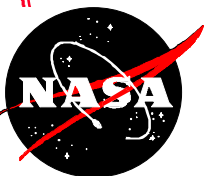
Future Work

Standards
- Continue standard based video research along with product compliancy and interoperability testing
- Continue working with Agency Communication Teams to ensure proper Desktop Video representation

Research and Development
- Compare fractal based algorithms to DCT and wavelet
- Migrate DCTune to Motion JPEG
- Integrating PIM into ARCLAN to support wide-scale Multicasting
- Evaluate DV application performance over NREN/NGI